# Evaluation of Top Ranked Libyan Universities Websites: A Comparative Analysis

**Mahmoud M.Alakrimi**
**Computer Department, College of Education, Abu Issa, Zawia University, Libya**
**E-mail:M.Elakrami@zu.edu.ly GSM:+218918791453**

**Abstract**- The Documentation and Information Department of all Libyan universities is working on developing the university's website to suit all users with their different experiences and ways of interacting, so it is necessary to test the ease of use of these sites. That is why the researcher seeks to evaluate and compare his performance of these sites and chose the order of work on the first six Libyan universities as stated in the global ranking of universities. Among the six criteria that show the common strengths and weaknesses of the six university websites. The results showed the success of most university websites in ensuring the continuity of communication with their servers, while most of them failed in the security aspect and their lack of maintaining continuous updates.

*Key Words: Web Metrics, Libyan Universities, Web Page Test, Websites Ranking, Website Security, Website Speed, Zawia University, Evaluation Academic Website.*

**Introduction** -The field of informatics is developing very rapidly, as it needs great efforts from the Documentation and Information Centre and great financial support from the university for the centre and for all the facilities and colleges of the university, so that those in charge of the university's website can produce it in a way that meets the needs and satisfies all users, whether he is a knowledge seeker or a user, for this Specialists and engineers should provide better technologies, media, and processes to users. Thus, it has become necessary for the Documentation and Information Center to create a site that aims to satisfy the users' quest, experience and interaction and raise the university's ranking among the corresponding universities sites. The researcher is working to help the Documentation and Information Center to provide readings and measurements from several aspects and criteria, including measuring the degree of security, the time of full appearance of the site, the ability of the site to maintain direct contact with the server, and the impact of some factors such as advertisements on performance. These measurements have positive results on site users in terms of increasing the following factors (ease of navigation, increased security, download speed, uploading, and ease of use). The most important factors in increasing the university's ranking are improving the site's services, the diversity of its topics that attract researchers and users, and the diversity of open source knowledge and keeping pace with its development.

Today's educational institutions use a rich web content list as a means. A good website can change the user's image of an organization [10]. Website design is quite a tedious task that is filled with many difficult tasks such as navigating, dealing with inexperienced people, gathering incorrect data, etc. – these may help or mislead users while they are browsing the website pages.

**Previous Studies.**

Referring to my previous research (Alakrimi M., Kora H.,,2020 [1]), which worked on excavating the problems of dealing with the electronic portal of the University of Al-Zawia from the point of view of the faculty members and finding weaknesses for the ease of use and helping to treat them, where the lack of financial support was the biggest obstacle for the users of the site.

A study (Treiblmaier H., Pinterits A., 2020 [13]) focused on users' perceptions of content and website design. Also, exploring and integrating Web properties to develop many different metrics and models for evaluating website properties as seen by Internet users.

Study (Bulla S., Hadagali G.,2020, [2]) The primary objective of this study is to evaluate the performance and content quality of central university website libraries in India. The tool used to analyze site libraries is Gtmetrix. Gtmetrix helps evaluate the time consumption of a fully loaded web page, total page size and more statistics for content collected by auditing from the library of sites under study.

A study (Ojino R., Ogao P., Mich L., Karume S.,2013, [8]) includes the challenges facing the websites of higher education institutions in Africa and what they face from: cultural differences, funding problems, language issues, and governance problems. The paper showed the results of the website quality assessment of three Kenyan universities. The study is based on an evaluation framework derived from a 7-dimensional model. The study made important suggestions for improving the Masindi Muliru University (MMUST) website.

Study (Kaur S., Kaur K., Kuar P.,2016, [7]) This paper aims to evaluate the various elements required to improve web performance. In this paper, a focused methodology has been put in place to find all possible criteria in website design with reference to some of the major universities in Punjab. This paper evaluated Punjab University websites using four automated tools and provided comparative results for different factors using the tools Pingdom, GTMetrix, Website Grader and Site Speed Checker.

A study (Olaleye S., Sanusi I., Ukpabi D., Okunoye A., 2018, [9]) conducted on 141 universities in Nigeria for the purpose of combining two theories of website quality to explain obstacles, improvement, quality and future updates of Nigerian university websites based on usability Processing speed, aesthetic design, interactive response, entertainment, confidence and utility.

Study (Vargas P., Galarza C., Ullauri L., Chanchi G.,2020, [14]) There are currently millions of websites, but not all of them are available and visible in search engines and in the various devices and technologies used. The results indicate that although an educational institution is ranked first in Webometrics and SCImago's ranking, it does not necessarily meet the requirements for web access. This study can be a guide for identifying organizational efforts to improve accessibility and visibility when designing more inclusive and visual websites.

A study (Sukmasetya P., Setiawan A., Arumi E.,2020, [11]) was conducted to assess whether UMM website contains acceptance criteria for site usability test, the result indicated that the average overall usability test score for measuring Website usage was 2.77, learnability aspects had an overall score of 2.83, efficiency was 2.73, remembering was 2.82, and an error of 2.65 and 2.79 for user satisfaction. These results indicate that the UMM website is really easy to use. Although there are shortcomings beside efficiency in the speed of access to information.

A study (Palmer J.,2002, [10]) focused on the need for metrics and demonstrated that metrics help organizations create more effective and successful websites.

**Strategy**: The first section is an introduction - it gives a background on the literature on which the study revolves and a presentation of the study's objectives. The second section relates to the tools and methods used in the study. The third section presents and discusses the results. The fourth section discusses the outcome and discussion of the performance of university sites in general. Finally, the fifth section is a summary and conclusion.

**I-Aim of the Study :**

The goal is not to evaluate the design of websites or academic content, but rather the technical aspect, which leads to ease of use.

1. The main objective of the comparison is to enhance the presence of the Zawia University website.
2. Supporting open access initiatives to significantly increase the transfer of scientific and cultural knowledge that is added from the university's offices and faculties to the entire community.
3. Promote change processes in academia, increase everyone's commitment and develop strategies.
4. Evaluate and compare the results of websites for the first six highest-ranking universities in Libya, based on a report from the Webmetric website, with a special focus on Al-Zawia University.
5. Finding common strengths and weaknesses among the six university websites.

## II-Tools and Methods.

**A. Research tools**: The webometrics website, which can be visited through http://www.webometrics.info, was used to select the top 6 universities in Libya at 10-October 2021. Then work on these sites and evaluate their performance separately using the free Web Page Test website, which can be visited from https://www.webpagetest.org and compare the results.

**B. Selected websites:** The first six Libyan universities were selected at the level of Libyan universities at 10-October 2021, Table No. (1) shows the university website:

**Table No. (1) The University Website of the study samples**

| University Website | Local Rank | University |
|---|---|---|
| https://uob.edu.ly | 1 | Benghazi University |
| https://uot.edu.ly | 2 | Tripoli University |
| https//misuratau.edu.ly | 3 | Misurata University |
| https://sebhau.edu.ly | 4 | Sebha University |
| https://omu.edu.ly | 5 | Omur Almoktar University |
| https://zu.edu.ly/university | 6 | Alzawia University |

**C. Procedure, Analytics and Evaluation Criteria:** This evaluation process will go through the guideline. The results will be presented in tables and graphs in order to facilitate comparison between universities' websites, through which the various points of interest such as strengths and weaknesses are clear. This, in turn, will enable us to identify the points that must be focused on to improve the performance of the Zawia University website.

The researcher focused on analyzing the four most important factors that all sites struggle to maintain their highest performance, namely:

First: Comparing university websites in terms of full loading time.
Second: Measuring the degree of safety of the sites.
Third: Study the time taken between the beginning of the request and the beginning of the response.
Fourth: HTTP keep-alive test.
Fifth: The stability of the site's content scheme (Layout Shift).

## III- Discussion and Results.

Measuring the performance of university websites Web page performance test result The researcher studied the performance of the first six universities, as they were ranked among the best Libyan universities, according to the results of the international university ranking program .We use WebPageTest, a service that performs a free website speed test from multiple sites around the world. This test was South Africa

using Google Chrome browser and Windows 7 computer at 06:00 PM 12-October 2021, and provides website performance metrics that help developers fine-tune their websites.

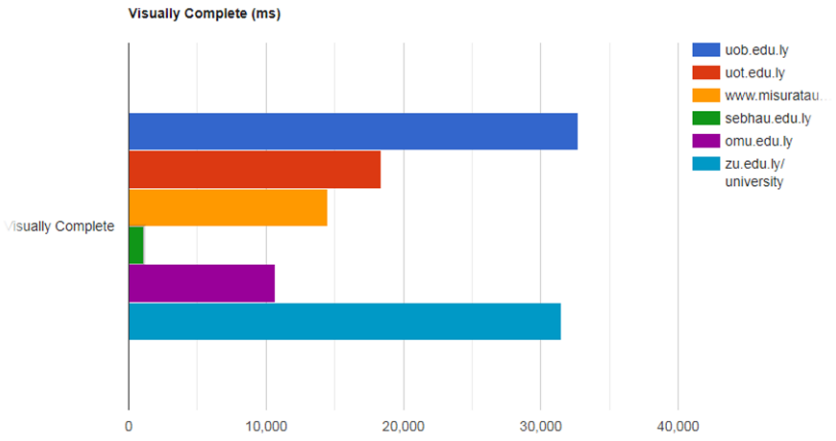
**First: Comparing university websites in terms of full loading time.**

The results of the Visually complete system, before starting, we look at the performance of the websites for the six highest-ranking universities by measuring the time taken to download the content of the start page through the graph Figure No. (1). Features of the full vision system:

- Lets you know how long it takes users to find out what information they are looking for.
- It gives a vision and impression to anticipate the results of the actual real user experience.
- Provides a simplified real scale for monitoring university websites from the user's perspective.
- Helps decision makers to develop and improve the performance of the site.

We note that the best performance from the Sebha University website, which took less than 1100 milliseconds for the site's start page to appear, although it comes in fourth place in the ranking of Libyan universities, while we find that the worst performance is from the University of Benghazi, which took more than 32700 milliseconds for the site's start page to appear. Although it comes in first place in the Libyan universities ranking, Al-Zawia University comes in the category of the worst performer for loading the start page with a time of 31500 milliseconds.The time taken for Tripoli University is 18400 milliseconds, the time taken by Misurata University is 14500 milliseconds, and the time taken by Omar Al-Mukhtar University is 10700 milliseconds.

Figure No. (1) shows the time variance when the start page loading of the websites is completed




These results can be improved when the following settings are processed:

- Threshold: Use this setting to specify the minimum visible area of each element (in pixels). The value is set from 0 to 10000, the default value is 50.

- Inactivity timeout for load actions: The time that a visually complete module waits for inactivity and no further spikes on the page after the load is performed. Use the (VCIT) property to specify the inactivity timeout. Time in milliseconds - use a value from 0 to 30000, the default value is 1000.
- XHR Transfer Delay: The time that a visually complete module waits after XHR is closed to start calculating. Use the (VCX) property to specify the mutation timeout. Time in milliseconds - use a value from 0 to 5000, the default value is 50.
- List of excluded URLs: Use regular expressions to specify URLs for images and iFrames to exclude them from detection by the visually complete module. Use the (IUB) property to create the list. Use a directive character as a separator between entries, such as \dynatrace \ .com \ / login | \ .dynatrace \ .com \ /logout. Ignored Mutations List: A query of the CSS selectors to select mutation nodes (elements that change) to ignore in the visual completeness and velocity index calculations. Use the (MB) property to create the list [16] .

**Second: Measuring the degree of safety of the Libyan universities websites:**

Security scores are based on two primary metrics:

A: Vulnerable versions of JavaScript libraries detected on the page even if one library is vulnerable it poses a potential security threat [17] This lowers the security score as follows:

- If the weaknesses are very dangerous, it will reduce the score to 70 points.
- If the weaknesses of the average risk lead to a 25-point reduction in the score
- If low-risk weaknesses lead to a 20-point reduction in the score

Vulnerable JavaScript Libraries: The second part of the test results page shows a list of JavaScript libraries that were discovered on the website and whose versions contain security vulnerabilities

B: Security headers, in which we check which HTTP Security headers are set for the website, which headers are missing but recommended to run like

- Content-Security-Policy adds 25 points
- X-Frame-Options adds 20 points
- X-XSS-Protection adds 20 points
- X-Content-type-options adds 20 points
- Strict-transport-security adds 25 points.

**Table No. (2) Safety Report of the Selected Sites**

| University | JavaScript libraries | Security Headers | Uni Rank |
|---|---|---|---|
| https://uob.edu.ly | Not Updated | Not Updated | 1 |
| https://uot.edu.ly | Not Updated | Not Updated | 2 |
| https://misuratau.edu.ly | Not Updated | Not Updated | 3 |
| https://sebhau.edu.ly | WordPress website | WordPress website | 4 |
| https://omu.edu.ly | Not Updated | Not Updated | 5 |
| https://zu.edu.ly | Not Updated | Not Updated | 6 |

Through the results of Table No. (2), new security vulnerabilities were continuously found in jQuery, Lodash, Angular and other libraries on the Zawia University website. For this reason, the researcher is advised to monitor these libraries to protect the university's web application. This site can be used (https:// app.snyk.io) and subscribe to it to send you notifications, development and update requests.

The Sebha University website obtained the highest scale among Libyan universities, for using a type of ready-made design for websites called WordPress website. There are threats to the lack of follow-up update the libraries.

**Third: Studying the time taken between the beginning of the request and the beginning of the response:**

Time to First Byte (TTFB) refers to the time between the browser requesting a page and when it receives the first byte of information from the server. This time includes a DNS lookup and connection establishment using a TCP handshake and an SSL handshake if the request is made over https. ( TTFB = responseStart – navigationStart)

That's why the time of the first byte is important for visitors because speed is very important on the Internet. According to recent research by Google itself, the chance of a user leaving the site doubles with a loading time of 3 seconds. You probably realize that on the Internet almost nothing seems as annoying as a slow-loading website. That's why the possibility of leaving the site and looking for something else is very high.

Delaying the loading time by an additional two seconds can cut the rating in half. So high TTFB is also referred to as website killer. It is important to know that TTFB is different from website speed. A website's speed is determined by many other factors, such as the time it takes to show a web page in the browser. But TTFB is a very important factor in site load time.

The time to first byte of web pages is less than 600ms according to Google. TTFBs over 600ms cause the audit to fail. Between 300 and 500 milliseconds is considered "reasonable" and less than 200 milliseconds, "good", a drop is always better.

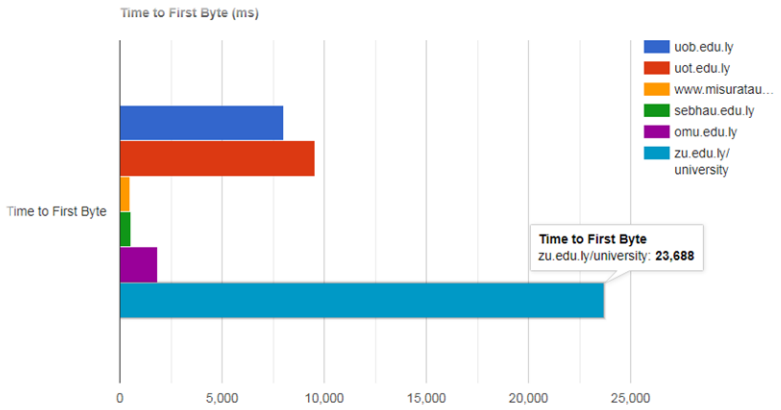
This is why many technical SEO experts consider 150 to 200 ms response time to be very good [19]. Table No. (3) shows a comparison of the TTFB time between the university sites and the study samples.

**Table No. (3) shows the time of TTFB**

| University | Page Load Time | Score (100) | TTFB Time (ms) | Uni Rank |
|---|---|---|---|---|
| https://uob.edu.ly | 2.464s | 0 | 103ms | 1 |
| https://uot.edu.ly | 5.755s | 0 | 430ms | 2 |
| https:/.misuratau.edu.ly | 1.532s | 93 | 179ms | 3 |
| https://sebhau.edu.ly | 1.098s | 91 | 149ms | 4 |
| https://omu.edu.ly | 2.248s | 0 | 241ms | 5 |
| https://zu.edu.ly | 3.588s | 0 | 253ms | 6 |

Through the results of Table No. (3) and Figure No. (2), it is clear that the case of the study at the University of Al-Zawia, the time of the first byte was 253 milliseconds, which is a good time.

Figure No. (2) shows the time of TTFB




This scale, which measures server interaction, is very important for the classification of universities, and for the University of Al-Zawia to maintain performance, it must maintain improvement and update. For this, the researcher suggests the following points to raise the degree of this scale [20]:

1. Use a Content Delivery Network (CDN). 2. Application code optimization.
3. Optimize queries to the database. 4. Ensure the fastest server response time.
5. Reduce requests to open links on the HTTP start page.
6. Use the response first and later (RFPL) cache.

**Fourth: HTTP keep-alive test:**

This metric shows the server's willingness to maintain the page service requested by the user. It is also known as a persistent HTTP connection, an instruction that allows a single TCP connection to remain open to multiple HTTP requests/responses. By default, HTTP connections are closed after each request. Keep-life also reduces CPU and memory usage on your server[21].

**Table (4) shows the results of the HTTP keep-alive test**

| University | http keep-alive | Score(100) | Uni Rank |
|---|---|---|---|
| https://uob.edu.ly | A | 100 | 1 |
| https://uot.edu.ly | A | 100 | 2 |
| https://.misuratau.edu.ly | A | 100 | 3 |
| https://sebhau.edu.ly | A | 100 | 4 |
| https://omu.edu.ly | F | 8 | 5 |
| https://zu.edu.ly | A | 100 | 6 |

With this criterion, the performance of most Libyan universities is high, and one of the reasons is due to the lack of advertisements on university websites.

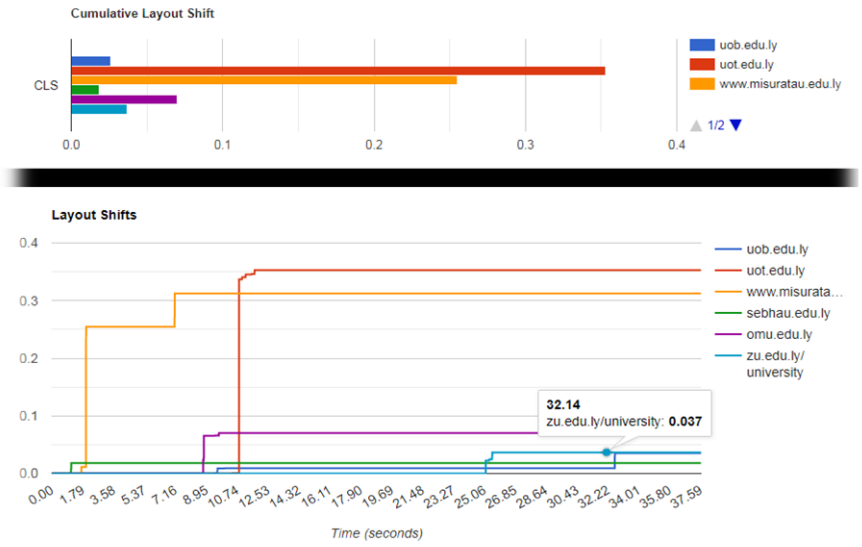
**Fifth: (CLS) Cumulative Layout Shift:**

This metric is for measuring the stability of the visual aspect of sites that influences user satisfaction and to illustrate their functionality and recognition Consider this example: You visit a site and see something interesting to read but when you are about to click on the link, it scrolls down the webpage, and you end up clicking Above an ad placed right above it, which is annoying, isn't it?

Figure (3) Distribution of CLS measurements


Through the results of figure No. (4), it is clear that the result of the study case, Al-Zawia University is less than 0.1, which is a good sign, which is in the third place after the University of Sebha and Benghazi, while the worst result of the University of Tripoli, which exceeded 0.35 and the University of Misurata, exceeded 0.25.

Figure No. (4) Comparison of CLS assessment performance for Libyan universities




**The Result and Discussion of the Performance of University Sites in General:**

Table No. (5) shows the performance evaluation of universities in general, with this evaluation, the highest score is A+ and the lowest score is F. The values are given as follows: A+ >= 95, A >= 75, B >= 60, C >= 50, D >= 29, E >= 14, F >= 0.

Scores are calculated based on the formula put together by SCOTT HELME [18]

The syntax is generic and includes a factor that downgrades any vulnerabilities discovered in JavaScript.

**Table No. (5) shows the evaluation of the performance of sites in general**

| University web page | Security score | First Byte Time | Keep-alive Enabled | Compress Transfer | Compress Images | Cache static content | Effective use of CDN |
|---|---|---|---|---|---|---|---|
| https://uob.edu.ly | F | F | A | A | A | B | A |
| https://uot.edu.ly | 0 | F | A | A | A | A | A |
| http/.misuratau.edu.ly | F | A | A | F | A | A | A |
| https://sebhau.edu.ly | A | A | A | A | A | A | A |
| https://omu.edu.ly | F | F | F | F | B | F | F |
| https://zu.edu.ly | F | F | A | B | D | C | A |

Table No. (6) shows the percentages resulting from the evaluation of the sites of Libyan universities in general, and it can be analyzed in a simplified way as follows:

**Table No. (6) the general assessment percentage**

| University web page | Security score | First Byte Time | Keep–alive Enabled | Compress Transfer | Compress Images | Cache static content | Effective use of CDN | AVG 100% |
|---|---|---|---|---|---|---|---|---|
| uob.edu.ly | 0% | 0% | 100% | 97% | 100% | 81% | 99% | 68.1% |
| uot.edu.ly | 0% | 0% | 100% | 100% | 97% | 94% | 100% | 70.1% |
| misuratau.edu.ly | 0% | 93% | 100% | 45% | 95% | 92% | 98% | 74.4% |
| sebhau.edu.ly | 91% | 91% | 100% | 100% | 96% | 97% | 100% | 96.4% |
| omu.edu.ly | 0% | 0% | 8% | 28% | 80% | 6% | 8% | 18.6% |
| zu.edu.ly | 0% | 0% | 100% | 83% | 69% | 50% | 98% | 57.1% |

1. Sebha University shows the general ranking above 96% with all evaluation criteria, so it gained the first place in the evaluation of the university's website, although it is ranked fourth locally. This high percentage is due to the use of ready-made templates when designing the site called WordPress, which is one of the most important strengths when evaluating the site.

2. The Benghazi University website shows that it has a general rating above 68%, and it is clear that the site designers neglected, periodic updates, updating libraries, organizing the start page. Despite the poor security of the site, it did not affect its first local ranking.

3. The University of Tripoli website shows that it has a general rating above 70%. It is evident that the website designers neglected, periodic updates, updating libraries, organizing the start page.

4. The Misurata University website shows that it has a general rating above 74%. It is clear that the website designers neglected the periodic updates of the libraries, which is

the result that represents the weak point of the site design, and the most important point of strength is the design of the start page, where the performance rate exceeds 93%.

5. The site of Omar Al-Mukhtar University shows that it has a general rating above 18%. It is clear that the site designers have failed in many aspects of the design, including, periodic updates, updating libraries, organizing the start page, compressing images, so there are many weaknesses in the site that make it a bad site And few visits.

6. The study case The Zawia University website shows that it has a general rating above 57%. It is clear that the tools and licenses required for the site designers are not available, which caused the following, the difficulty of making periodic updates, stopping the updating of libraries, the lack of organization of the start page, the frequent use of image files instead of text files, lack of Determining the period of retention of data in the temporary memory of the page. For this, the most prominent weaknesses lie in providing the capabilities to maintain the up-to-dateness of the Zawia University website.

## V-Summary and Conclusions:

The results of this research indicate an additional advantage of making university websites usable on the web, as most universities have positive results, except for the security aspect. This research proves that considering the possibility of using university websites helps in improving the ranking of university websites in international university ranking systems.

This study is concerned with comparing the results obtained from the website performance evaluation system and providing usable results regarding the common types of performance problems that affect the usability of the university websites under study, including: security neglect, slow server, annoying ads, misleading and broken links, site display time, image problems, difficulty interacting with the website.

These obtained results provide specific and useful data and values for university institutions regarding the common types of errors of their websites. These issues must be taken into account, investigated, and improved in order to improve the overall usability of university websites.

## VI- References.

[1].العكرمي، محمود محمد، بن كورة & ,حامد حسين. (2020). دراسة المشاكل التي تواجه أعضاء هيئة التدريس عند التعامل مع البوابة الالكترونية لجامعة الزاويـــة.

[02].Bulla S., Hadagali G., Analysis of central universities' library websites in India: A study,(2020), Journal of Indian library association, vol. 56 (3), September (2020).

[03].Björneborn L., and Ingwersen P., Towards basic framework of webometrics, J. of American Society for Information Science and Technology, (2004), 55(14): 1216–1227.

[04].Calero C., Ruiz J., Piattini M., Classifying Web Metrics Using the Web Quality Model, Online Information Review, Emerald Group, (2005) 29 (3), 227-248.

[05].Dhyani D., Ng W., Bhowmick S., A Survey of Web Metrics, Nanyang Technological University. ACM Computing Surveys, (2002), 34(4), 469–503.

[06].Hong I., A Survey of Web Site Success Metrics Used by Internet- dependent Organizations in Korea, Internet Research, Emerald Group, (2007),17(3), 272-290.

[07].Kaur S., Kaur K., Kuar P., An Empirical Performance Evaluation of Universities Website, International Journal of Computer Applications (0975–8887) Volume 146 – No.15, July (2016).

[08].Ojino R., Ogao P., Mich L., Karume S., The Quality of Kenyan University Websites: A Study for the Re-engineering of the Masinde Muliro University Website, Journal of E-Learning and Knowledge Society, September (2013).

[09].Olaleye S., Sanusi I., Ukpabi D., Okunoye A., Evaluation of Nigeria Universities Websites Quality: A Comparative Analysis, (2018), Library Philosophy and Practice (e-journal).

[10].Palmer J., Web Site Usability Design and Performance Metrics, Information Systems Research, (2002), 13(2), 151- 167.

[11].Sukmasetya P., Setiawan A., Arumi E., Usability evaluation of university website: a case study, Journal of Physics, Conference Series (2020), Department of Informatics Engineering, Universitas Muhammadiyah Magelang, Magelang, Indonesia.

[12].Stolz C., Viermetz M., Skubacz M., Neuneier R., Guidance Performance Indicator- Web Metrics for Information Driven Web Sites , IEEE/WIC/ACM International Conference on Web Intelligence (2005), 186–192.

[13]-Treiblmaier H., Pinterits A., Developing Metrics for web sites , Journal of Computer Information Systems , March (2010), Vienna University of Economics and Business.1090 Vienna, Austria.

[14]-Vargas P., Galarza C., Ullauri L., Chanchi G., Improve Accessibility and Visibility of Selected University Websites. Springer Nature Switzerland AG 2020, I. L. Nunes (Ed.): AHFE 2020, AISC 1207, pp. 1–7, 2020 https://doi.org/10.1007/978-3-030-51369-6_31.

[15].Warren P., Gaskell C., Boldyreff C., Preparing the Ground for Website Metrics Research, Proceedings of the 3rd International Workshop on Web Site Evolution ,(2001) IEEE,UK 1717, https://digitalcommons.unl.edu/libphilprac/1717.

[16].Dynatrace provides software intelligence to simplify cloud complexity and accelerate digital transformation https://www.dynatrace.com.

[17].build security into continuous development process, https://snyk.io/blog/website-security-score-explained/

[18].Analyze the HTTP response headers of other sites, https://securityheaders.com.

[19].The TTFB is to measure the speed of a webpage https://www.marketingtracer.com/seo/time-to-first-byte.

[20].Optimize Time to First Byte (TTFB), https://www.criticalcase.com/blog/how-to-optimize-time-to-firs-byte-ttfb.html.

[21].Offers shared web hosting ,https://www.hostinger.com.

[22].Shreoshe_hosh, Focusing on metric-driven SEO services designed to drive traffic to client's websites https://www.stanventures.com

[23].How To Use WebPageTest and its API, https://css-tricks.com/use-webpagetest-api.